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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re US Application of

Yoshinori Shibata and Junichi Masuda

US Serial Number: 09/350,297

US Filing Date: 9 July 1999

For: BATTERY POWERED TABLE SAWS

VERIFICATION OF TRANSLATION

Honorable Commissioner of Patents and Trademarks

Washington, D.C. 20231

Sir:

I, HIDESHI IIDA, work at OKADA PATENT & TRADEMARK OFFICE, Nagoya Chamber of Commerce & Industry Bldg., 10-19, Sakae 2-chome, Naka-ku, Nagoya-shi, Aichi-ken, Japan and declare that:

- (1) I understand both Japanese and English;
- (2) I translated Japanese Application Serial No. 10-194448, which was filed on July 9, 1998;
- (3) the attached English translation is a true and correct translation of the above-identified Japanese Application to the best of my knowledge and belief; and
- (4) that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 USC 1001, and that such false statements may jeopardize the validity of the application or any patent issuing thereon.

September 21, 2001

Date

Hideshi Iida

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Part #5

movably supported on the table, which circular saw unit can move downward to cut the workpiece that is fixed onto the table.

Although some of the former portable saws have battery powered motors, the latter circular table saws are usually driven by an AC power source and no battery-driven type
5 circular table saws have been proposed.

[0003]

[Problems to be Solved by the Invention]

Thus, known circular table saws all require an electric cord to be connected to an outlet. As a result, the circular table saws can not be used in places in which no outlets are
10 present. For this reason, the operator cannot freely choose the places in which cutting operations will be performed.

It is, accordingly, an object of the present invention to provide circular table saws that can be used in any location regardless of the position of outlets.

[0004]

15 [Means for Solving the Problems]

Thus, according to claim 1, a circular table saw comprises a table, on which a workpiece is placed, and a circular saw unit that moves vertically relative to the table, the circular saw unit including an electric motor and a saw blade that is rotated by the electric motor; the circular table saw is constructed such that the electric motor is rotated by a battery
20 as a power source.

With this circular table saw, the electric motor for rotating the saw blade is rotated by the battery as a power source. Therefore, it is not necessary to connect an electric cord to an outlet as is required for known circular table saws. As a result, the circular table saw can be used in places that are distant from outlets or in places that do not have outlets, and the
25 circular table saws can provide remarkably improved versatility.

[0005]

According to claim 2, in a circular table saw as in claim 1, the battery is mounted on an operation handle for vertically moving the circular saw unit.

With this circular table saw, if the handle is mounted on a motor casing, the battery
30 may be placed at a position relatively close to the electric motor; therefore, the electric line connecting between them can be shortened and the wiring of the electric line can be simplified. In addition, if the switch for ON/OFF operation of the motor is placed on the operation handle,

Therefore, the cutting operation can be performed more easily.

In addition, by positioning the battery adjacent to the pivotal fulcrum, it is possible to minimize the increase in the operational force that may be caused by the battery when vertically moving the circular saw unit. Therefore, due to the decrease of the spring constant, it is still possible to reduce the force that is required for the vertical moving operation.

[0008]

According to claim 5, in a circular table saw as in claim 1, a discharge hole for discharging foreign particles is formed in a battery case, on which the battery will be mounted.

With this circular table saw, in particular when the battery is removed, foreign particles, such as cutting chips, may easily enter the battery case. If the foreign particles are deposited on the bottom of the battery case, conduction to the battery may be hindered. However, in such a case, the foreign particles may be exhausted to the outside, so that the deposition of the foreign particles on the bottom of the battery case may be prevented. In addition, the foreign particles also may be discharged through an opening of the battery case (an opening for inserting the battery).

[0009]

According to claim 6, in a circular table saw as in claim 1, the electric motor, a handle portion and the battery are disposed within substantially the same plane as the saw blade.

20 With this circular table saw, the circular saw unit may be balanced with respect to the left and right directions. In addition, if a cutting operation known as a bevel cutting operation is performed with the table saw unit inclined in a left or right direction, the range of inclination angles can be substantially the same in both the left and right directions.

The electric motor may be easily balanced in position with respect to the left and right directions, for example, by incorporating an arrangement for transmitting the drive force of the electric motor using a chain or a gear train. Thus, if the saw blade is mounted directly on the output shaft of the electric motor, the electric motor may be disposed on either the right or left side with respect to the saw blade.

[0010]

30 [Embodiments of the Invention]

Various embodiments of the present invention will now be described with reference to FIGS. 1 to 11. The basic structures of circular table saws of these embodiments are the

same as each other and do not involve any changes from known structures. Therefore, with reference to FIG. 1, which shows a first embodiment, the basic structure of a circular table saw 1 of the first embodiment will first be briefly described.

5 In FIG. 1, numeral 2 designates a base. A table 3 is rotatably supported on the upper surface of the base 2. Auxiliary tables 2a, 2a are disposed on both sides of the base 2, and the upper surfaces of the auxiliary tables 2a, 2a are positioned so as to be flush with the upper surface of the table 3. A fence 4 for positioning a workpiece to be cut is mounted between the auxiliary tables 2a, 2a so as to extend across the table 3.

10 A laterally pivotal base 5 having a disk-like configuration is disposed integrally with the rear portion (right end portion as viewed in FIG. 1) of the table 3. A laterally pivotal arm 6 is supported on the laterally pivotal base 5, so that it can pivot laterally (in a direction perpendicular to the sheet surface of FIG. 1). The circular saw unit 10 is vertically pivotally supported on the upper end of the laterally pivotal arm 6 by means of a vertically pivotal support shaft 7.

15 [0011]

An electric motor 12 for rotating a saw blade 13 is mounted on one lateral side of a blade case 11 of the circular saw unit 10. The saw blade 13 is mounted on an output shaft of the electric motor 12. Substantially the upper half of the saw blade 13 is accommodated within the blade case 11, and its lower half is accommodated within a blade cover 14 that is mounted on the blade case 11 and that can be opened and closed. The blade cover 14 can be opened and closed by rotation around the rotational axis of the saw blade 13; it opens and closes in response to vertical pivotal movement of the circular saw unit 10 by means of a link mechanism 15 that is mounted between the lateral pivotal arm 6 and the blade case 11. Thus, when the circular saw unit 10 is pressed downward, the blade cover 14 rotates in an opening direction in response to this movement; therefore, substantially the lower half of the saw blade 13 is exposed so as to be brought in such a state that the workpiece secured onto the table 3 can be cut.

20 On the other hand, when the circular saw unit 10 pivots upward, the blade cover 14 rotates in a closing direction in response to this movement. Therefore, the exposed lower half of the blade 13 is brought to be accommodated within the blade case 14.

30 Although not illustrated herein, a compression spring is interposed between the blade case 11 and the laterally pivotal arm 6, so that the circular saw unit 10 is biased upward.

During the cutting operation, the operator may press the circular saw unit 10 downward against the biasing force of the compression spring.

[0012]

Further, an operation handle 16 is disposed on one lateral side of the electric motor 12 and extends laterally. A switch 17 for turning the electric motor 12 ON and OFF, and a lock button 18 for locking the switch 17 in an ON position, are mounted on the operation handle 16. A battery case portion 21 is disposed integrally with the rear portion (right end portion in the drawings) of the operation handle 16. A battery 20 is mounted within the battery case portion 21, and the electric motor 12 is started by the battery 20 as a power source.

The battery 20 is a rechargeable battery that is generally used in conventional power tools, and this embodiment involves no changes in the battery. In the drawings, number 20a designates push buttons that are disposed on both lateral sides of the battery 20, and the push buttons 20a, 20a have respective engaging claws 20b formed on their ends. The battery 20 is inserted into the battery case portion 21 in the state in which both push buttons 20a are depressed to withdraw the engaging claws 20b. Then, both push buttons 20a, 20a are released, so that both engaging claws 20b engage receiving portions (not shown) formed on the inner surface around the opening of the battery case portion 21. As a result, the battery 20 is fixed in position. On the other hand, when both push buttons 20a, 20a are depressed, the battery 20 can be removed from the battery case portion 21.

[0013]

DC power source terminals 21b, 21b (one is a positive terminal while the other is a negative terminal, and only one of them is shown in the drawings) for connection to the battery 20 are disposed on the bottom of the battery case portion 21 and extends therefrom. Both power source terminals 21b, 21b are connected to a motor drive circuit. Therefore, when the switch 17 is turned ON, the battery 20 as a power source rotates the electric motor 12, so that the saw blade 13 rotates.

A discharge hole 21a is formed adjacent to the bottom of the battery case portion 21 and serves to discharge foreign particles that have entered the battery case portion 21. In addition, foreign particles also may be exhausted through the opening of the battery case portion 21.

A lid 22 is mounted on the opening of the battery case portion 21 by means of a

hinge 22a and can be opened and closed. When the lid 22 is closed, the interior of the battery case portion 21 can be shielded, so that foreign particles can be prevented from entering.

[0014]

With the circular table saw 1 of the first embodiment constructed as described above,
5 the electric motor 12 for rotating the saw blade 13 is rotated by the battery 20 as a power source. Therefore, the circular table saw 1 can be used without connecting a power source cord to a power source outlet, as is required in known circular table saws. For this reason, the circular table saw 1 of the first embodiment even can be used in places in which power source outlets are not closely located. In addition, the circular table saw 1 can be used even outdoors
10 where power source outlets are not available. Therefore, the circular table saw 1 can provide improved versatility.

In addition, in the first embodiment, the battery 20 is mounted on the operation handle 16 and is thus disposed in a position substantially adjacent to the electric motor 12, the switch 17 and the motor drive circuit. Therefore, an electrical line having a short length may
15 reach both the terminals 21b, 21b, thereby simplifying the wiring operation.

Further, by closing the battery casing 21 with the lid 22, foreign particles, such as cutting chips, may be prevented from entering. Therefore, problems can be prevented, such as improper mounting of the battery 20 and poor electrical conduction.

Moreover, because foreign particles entering the battery case 21 may be discharged
20 from the discharge hole 21a, the interior of the battery case 21 can be easily cleaned. Further, the foreign particles may be discharged through the opening of the battery case 21.

[0015]

A circular table saw 30 of a second embodiment is shown in FIG. 2. In the circular table saw 30 of this second embodiment, an electric motor 32 also is driven by a battery 31 as a
25 power source. Thus, a battery case portion 34 is integrally formed with a front portion of an operation handle 33 that is operated for vertical movement, and the battery 31 is mounted within the battery case portion 34. The battery 31 also has push buttons 31a, 31a on both lateral sides thereof, and each of the push buttons 31a, 31a has an engaging claw 31b formed on its end. Therefore, the battery 31 may be mounted and removed in the same manner as the
30 battery 20 of the first embodiment.

Also, two DC power source terminals 34a, 34a are mounted on the bottom of the battery case portion 34 in the same manner as the first embodiment. The other constructions

are the same as the first embodiment, and description will be omitted by utilizing the same reference numerals.

With the circular table saw 30 of the second embodiment constructed as described above, the circular table saw 30 also can be used without being connected to a power source outlet, so that versatility can be improved.

In addition, in the case of the second embodiment, the battery 31 may be disposed in a position closer to the switch 17 if the battery 31 is mounted on the front portion of the operation handle 31. Therefore, the wiring operation can be easily performed in this respect.
[0016]

A third embodiment of the present invention will now be described. As shown in FIGS. 3 and 4, a circular table saw 45 of this third embodiment is characterized in that a battery 40 is mounted on a base 41 that rotatably supports a table 3. In this third embodiment, the battery 40 is mounted on the front side of one of two auxiliary tables 41a, 41a (the one on the lower side as viewed in FIG. 4, which is the side that is opposite to the electric motor), which auxiliary tables are disposed on both lateral sides of the base 41.

Thus, a battery case portion 41b is formed on the front surface of the auxiliary table 41a disposed on the lower side as viewed in FIG. 4. A battery 40 is mounted within the battery case portion 41b such that it is inserted into the battery case portion 41b. On the other hand, the battery 40 may be removed from the battery case portion 41b in order to be charged. As in the first and second embodiments, the battery 40 includes push buttons 40a on opposite sides thereof for mounting and removing operations.

Also, DC power source terminals 41c, 41c are disposed on the bottom of the battery case portion 41b. Both DC power source terminals 41c, 41c are connected to a motor drive circuit, which includes the electric motor 12 and the switch 17.
[0017]

In this third embodiment, the circular saw unit 46 involves no changes from known structures. Thus, the circular saw unit 46 is laterally pivotally supported by the laterally pivotal base 5 and the laterally pivotal arm 6 disposed on the rear portion of the table 3 and is also vertically pivotally supported by the vertically pivotal support shaft 7 of the laterally pivotal arm 6. In addition, due to the link mechanism 15 interposed between the blade case 11 and the laterally pivotal arm 6, the blade cover 14 opens and closes as the circular saw unit 46 vertically pivots. Therefore, the lower half of the saw blade 13 may be exposed or may be

accommodated within the blade cover 14.

In addition, an electric motor (not shown in FIG. 3) and an operation handle 47 are mounted on one side of the blade case 11. A switch 47a and a lock button 47b for holding the switch 47a in an ON position are mounted on the operation handle 47. When the switch 47a is turned ON, the electric motor starts, so that the saw blade 13 rotates.

[0018]

With the circular table saw 45 of the third embodiment described above, the battery 40 as a power source also drives the electric motor. Therefore, it is not necessary to connect a power source cord to an outlet as required with known circular table saws; thus, the circular table saw 45 may provide improved versatility.

In particular, with this third embodiment, a single battery 40 is mounted on the auxiliary table 41a on the side that is opposite to the electric motor 12. Therefore, it is possible for the battery 40 to serve as a counterweight for counter-balancing the weight of the electric motor 12.

15 - In addition, because the battery 40 is mounted on the front portion of the base 41 that is opposite to the side on which the circular saw unit 46 is supported, the weight of the battery 40 also may serve as a counterweight to the circular saw unit 46. Therefore, the stability of the circular table saw 45 in the installed position may be improved.

[0019]

20 The battery 40 may be mounted not only on one side but also on each of the front portions of the auxiliary tables 41a, 41a as indicated by dotted lines in FIG. 4, so that the function as a counterweight against the circular saw unit 46 may be further improved.

Alternatively, the battery 40 may be mounted on each of the rear surfaces of the auxiliary tables 41a, 41a as also indicted by dotted lines in FIG. 4.

25 [0020]

A circular table saw 50 according to a fourth embodiment is shown in FIGS. 5 to 7. The fourth embodiment embodies the invention of claim 4 and is constructed to mount a battery 52 on the rear portion of a blade case 51 adjacent to the vertically pivotal support shaft 7. In this embodiment, the battery 52 is mounted within a cylindrical battery case portion 53 in such a manner that it is inserted into the battery case portion 53. This embodiment is similar to the previous embodiments in this respect. Also, similar to the previous embodiments, the battery 52 is a rechargeable type and has push buttons 52a, 52a for mounting and removing

[0022]

For the reasons described above, a weaker compression spring may be used due the battery 52 functioning as a counterweight. Thus, even if a compression spring having a smaller spring constant is used, the battery 52 may function as a counterweight in order to supplement the function of the compression spring. Therefore, the circular saw unit 55 can smoothly move to the uppermost position and can be held in the uppermost position when the operator releases the downward pressing force.

Because the biasing force of the compression spring can be reduced as described above, the operator can press the circular saw unit 55 downward using a smaller force. Therefore, the circular saw unit 55 can be easily handled during the cutting operation.

In addition, during the step of pressing the circular saw unit 55 downward, the center of gravity G of the battery 52 may be held substantially on the vertical line V and does not move by a large distance toward the side of the circular saw unit 55 (see FIG. 6). Therefore, the weight of the battery 52 is not substantially applied in a direction that will cause the circular saw unit 55 to move downward and does not resist the movement of the circular saw unit 55 when it moves upward.

[0023]

A fifth embodiment of the present invention is shown in FIGS. 8 and 9. A circular table saw 60 of this embodiment is different from the previous embodiments in that a battery 61 is mounted on a circular saw unit 62 on the side that is opposite to the electric motor. In other respects, no changes are involved. Thus, for the aspects that involve no changes, the same reference numerals have been used and description will be omitted.

A battery case portion 64 is disposed on a blade case 63 on the lateral side opposite to the electric motor 12 and adjacent to the vertically pivotal support shaft 7. The battery 61 is mounted within the battery case 64 in such a manner that the battery 61 is inserted into the battery case 64. DC power source terminals 64a, 64a are disposed at the bottom of the battery case 64 in the same manner as the previous embodiments. Both DC power source terminals 64a, 64a are connected to a motor drive circuit for rotating the electric motor 12.

By mounting the battery 61 on the side opposite to the electric motor 12 as described above, the battery 61 may serve as a counterbalance against the electric motor 12, so that the weight of the circular saw unit 62 can be balanced.

In addition, with the circular table saw 60 of the fifth embodiment, the electric motor

12 for rotating the saw blade 13 also is rotated by the battery 61 as a power source. Therefore, it is not necessary to connect a power source cord to a power source outlet as required in the known constructions. Therefore, the usable area of the circular table saw 60 can be enlarged, and versatility can be remarkably improved.

5 [0024]

A sixth embodiment of the present invention is shown in FIG. 10. Although the circular table saws 1, 30, 45, 50 and 60 of the previous embodiments are types, in which the saw blade 13 is directly connected to the output shaft of the electric motor 12, the sixth embodiment is embodied as a circular table saw 70 that is a belt-drive type, in which the rotation of an electric motor 73 is transmitted to a saw blade 72 by means of a belt 71. This circular table saw 70 is constructed such that a circular saw unit 80 can slide along the surface of a table 74 in forward and rearward directions (left and right directions in the drawings) by means of a slide support portion 75 disposed on the rear portion of a table 74. The table 74 is rotatably supported on a base 76.

15 In this circular table saw 70, a battery 82 is mounted on an operation handle 81 of the circular saw unit 80, and the electric motor 73 is rotated by the battery 82; this rotation is transmitted to the saw blade 72 by means of the belt 71.

With the circular table saw 70 as described above, the same operation and effects as in the previous embodiments also can be attained.

20 In addition, by virtue of the belt drive type construction, the electric motor 73, the battery 82 and the handle portion 81 may be disposed within substantially the same plane, as shown in FIG. 11. Therefore, the weight of the circular saw unit 80 may be balanced with respect to the right and left directions. In particular, because the electric motor 73 may be disposed within substantially the same plane as the saw blade 72 (and substantially equally on the right and left sides), the circular saw unit 80 may be permitted to pivot by substantially the same angle on both the right and left side directions when an operation known as a bevel cutting operation is performed. Therefore, in this respect, the circular table saw also may provide improved versatility.

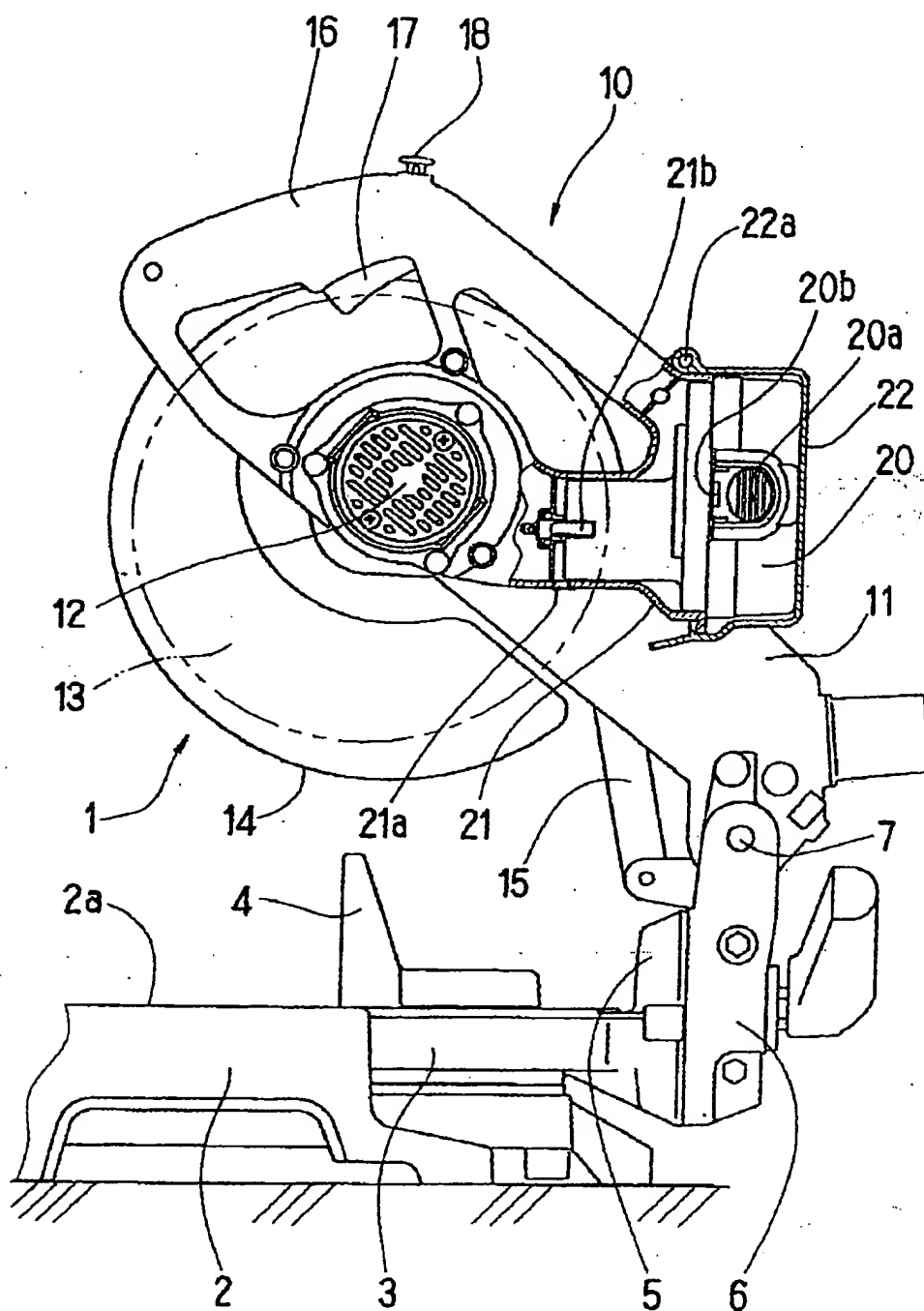
25 Further, with the battery 82 arranged between the electric motor 73 and the handle portion 81, the wiring operation between them can be easily performed.

[0025]

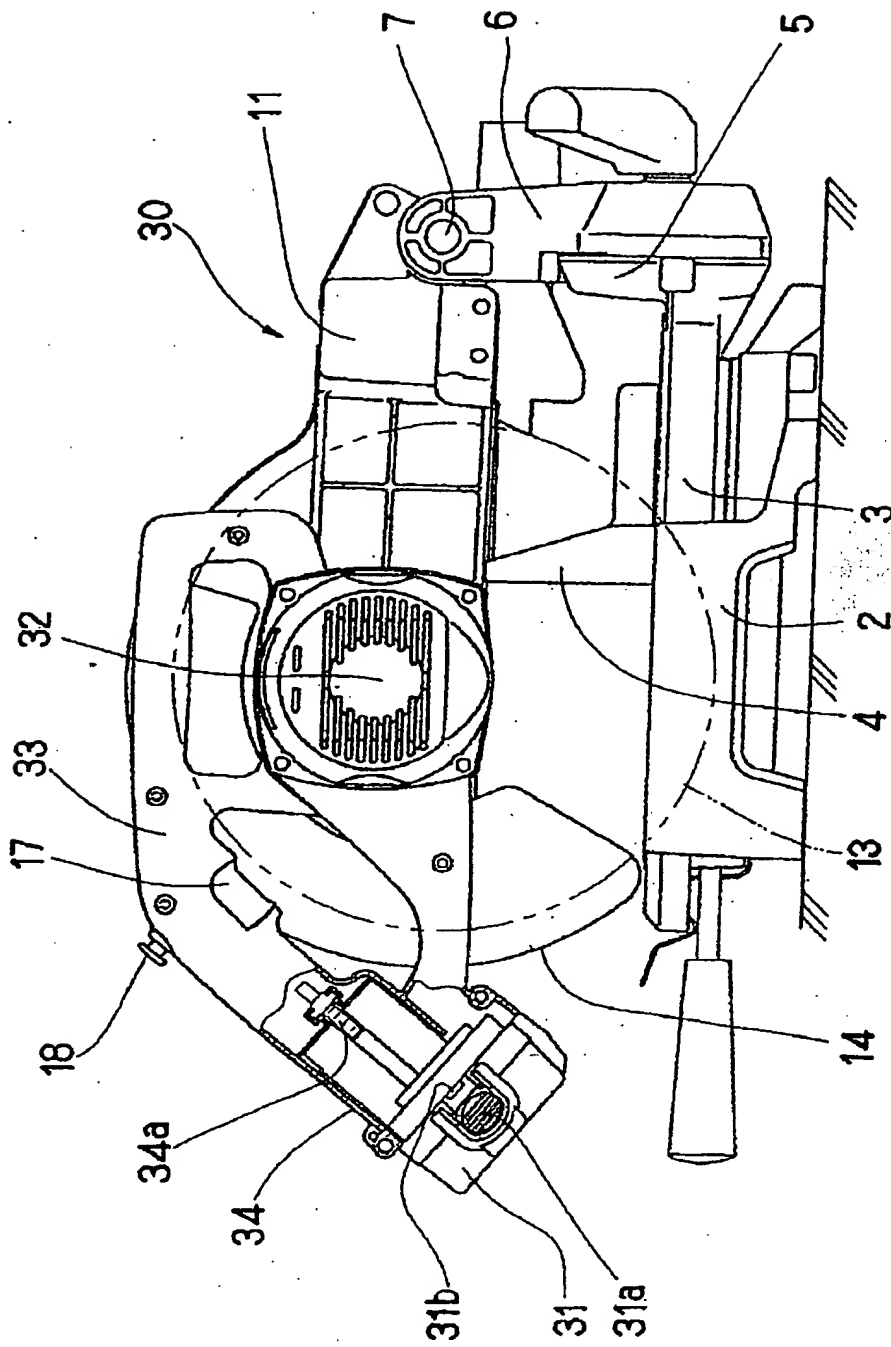
The second to sixth embodiments may be practiced with further modifications. For

[Name of Document] Drawings

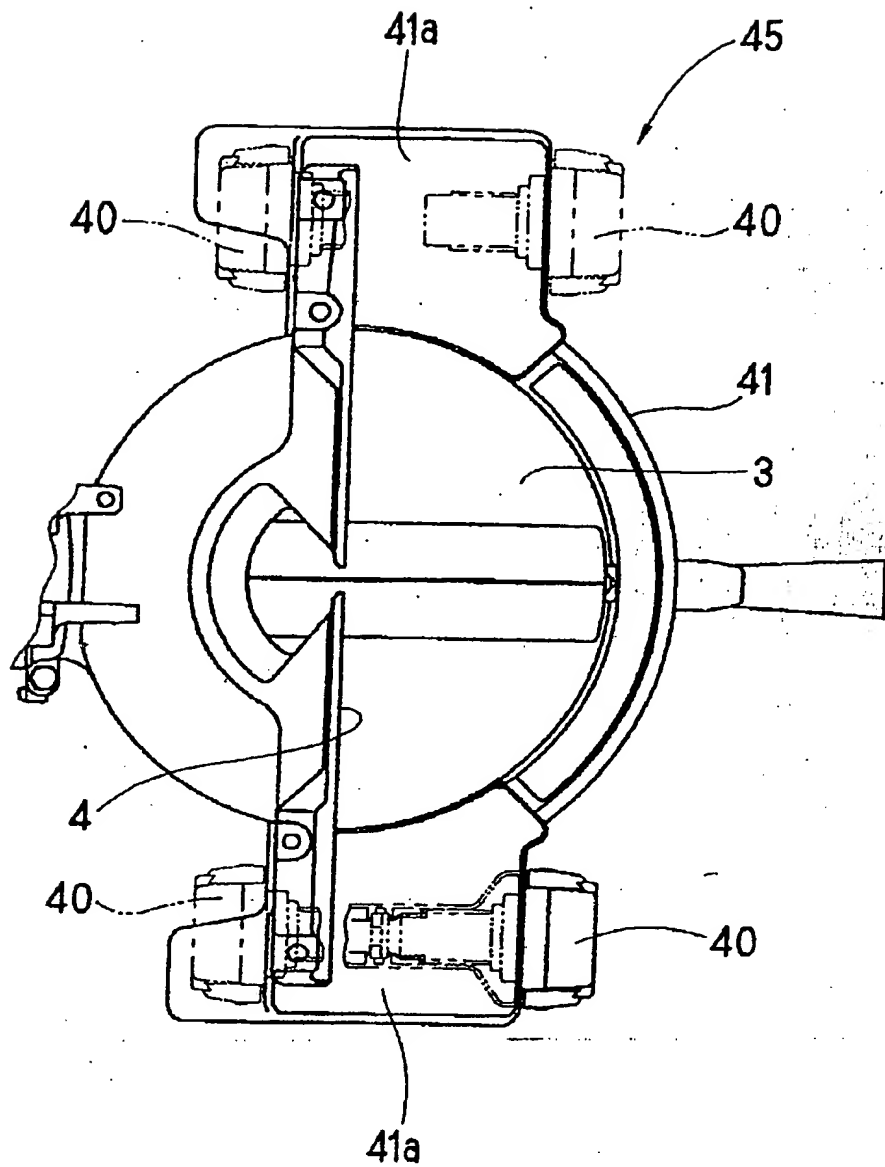
[FIG. 1]



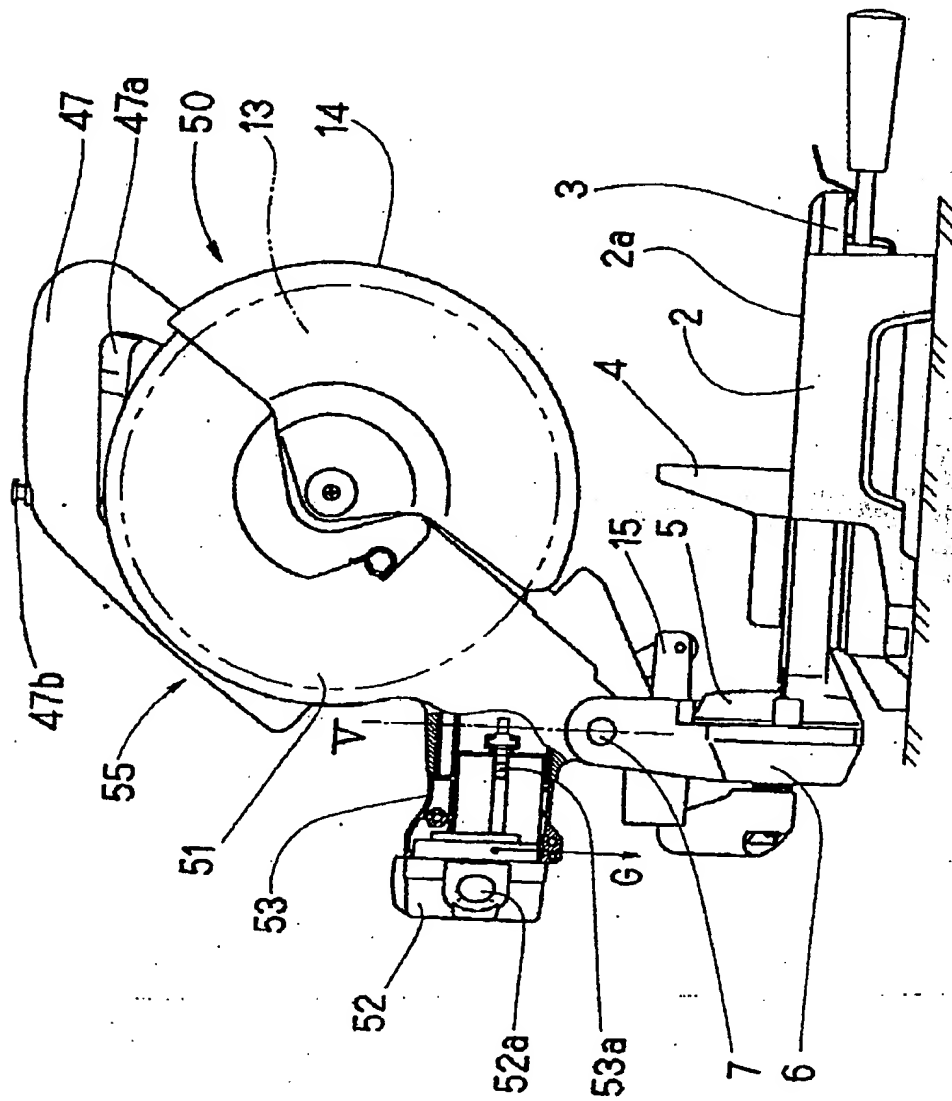
[FIG. 2]



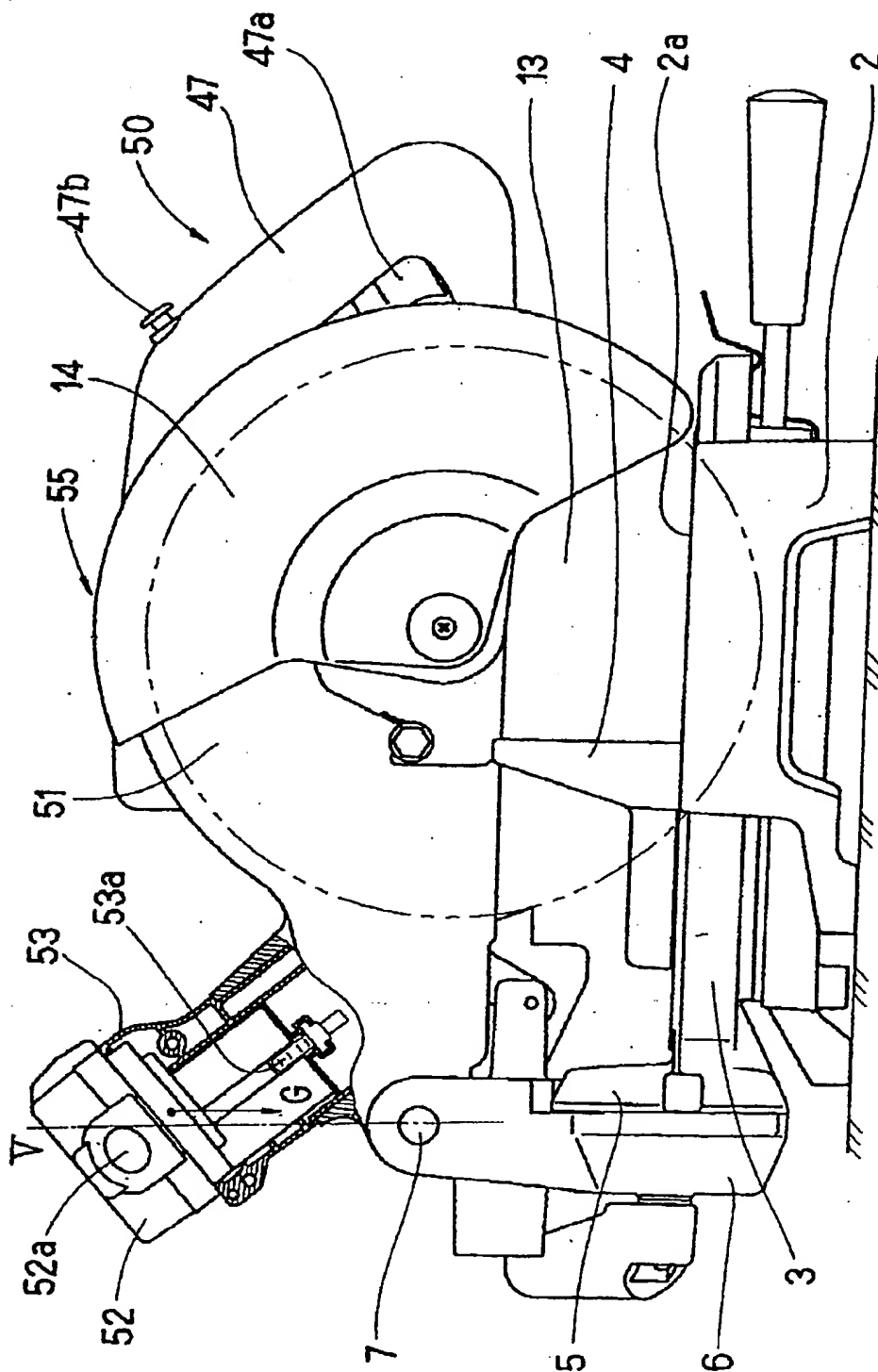
[FIG. 4]



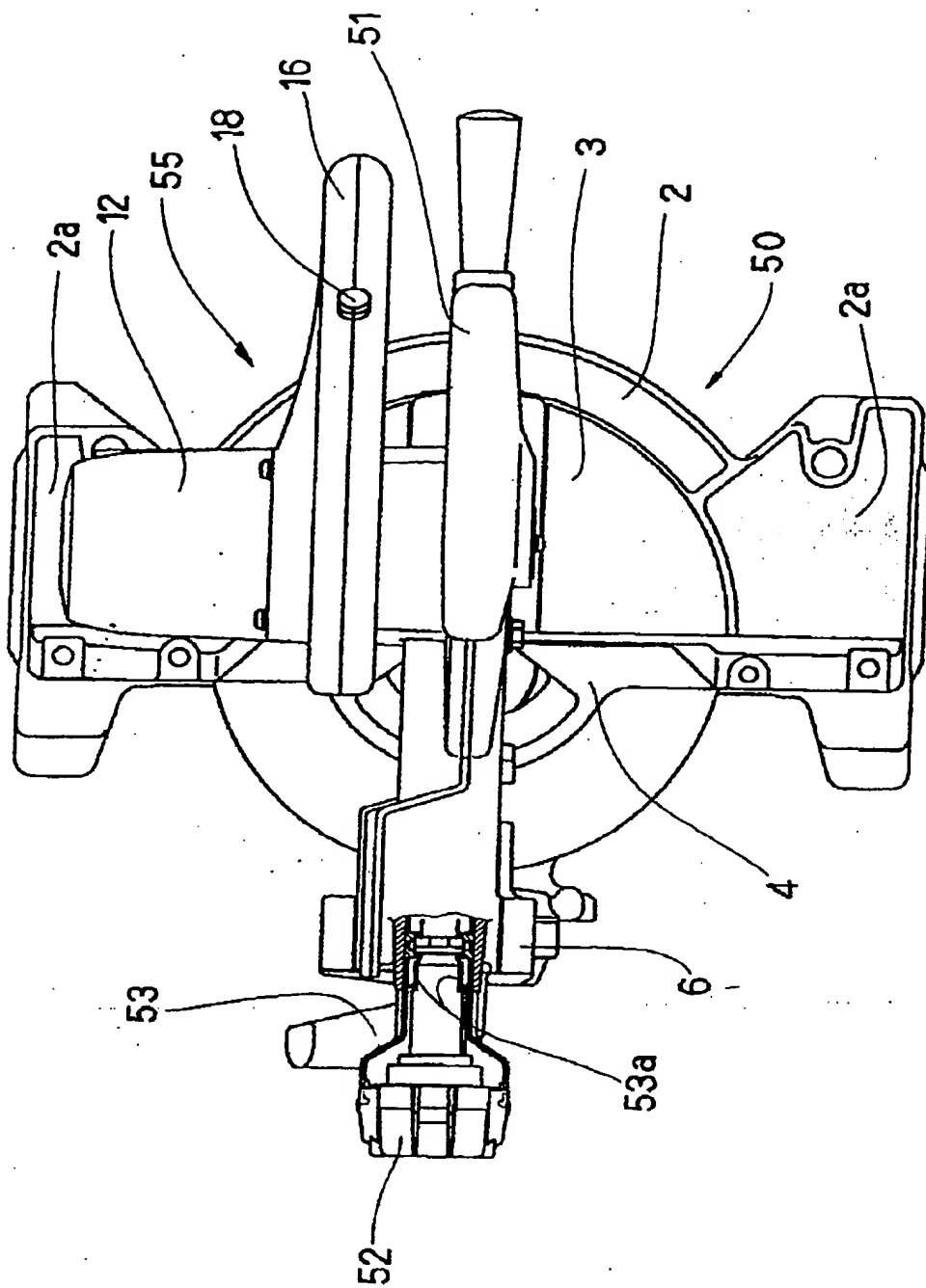
[FIG. 5]



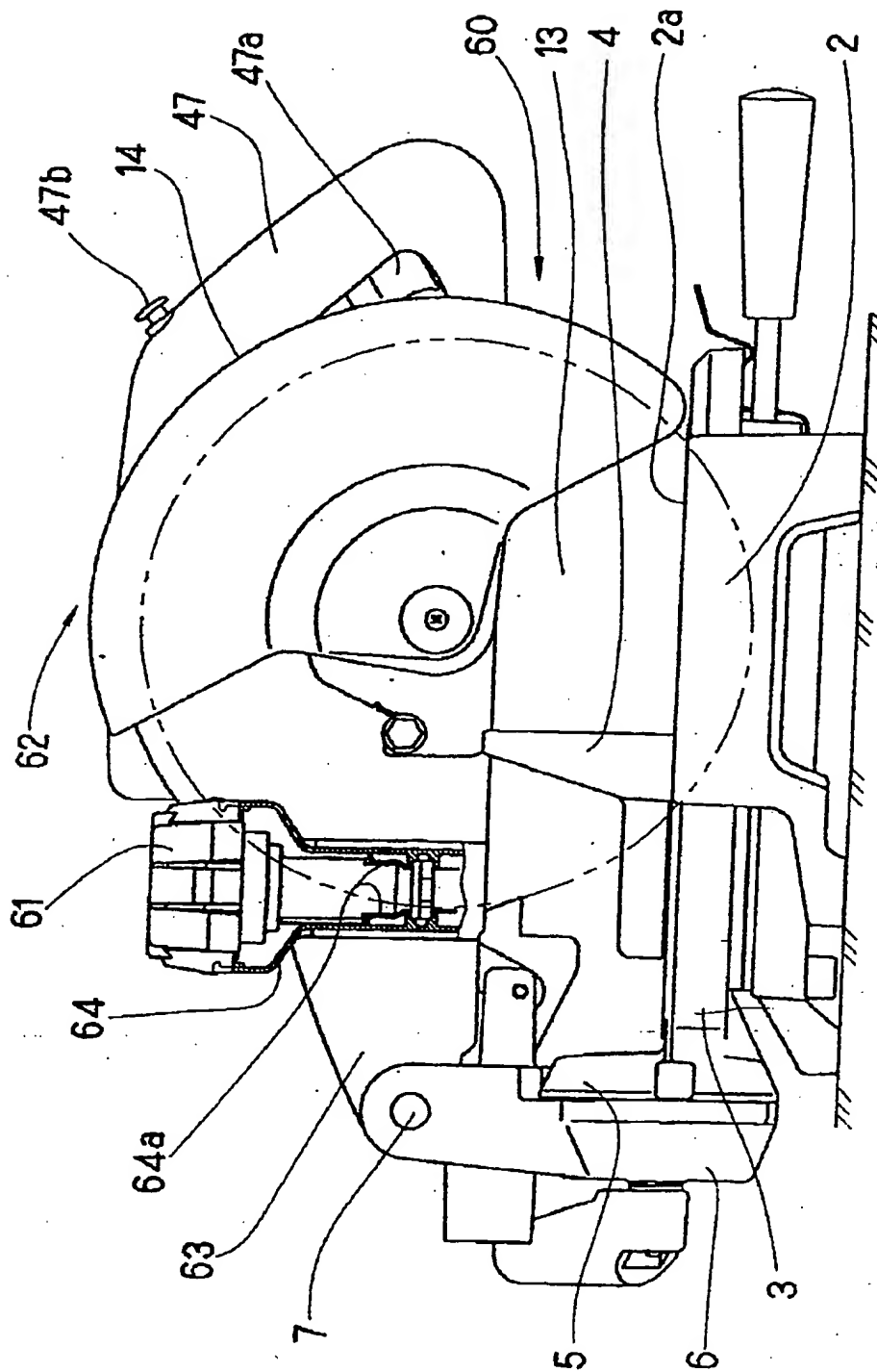
[FIG. 6]



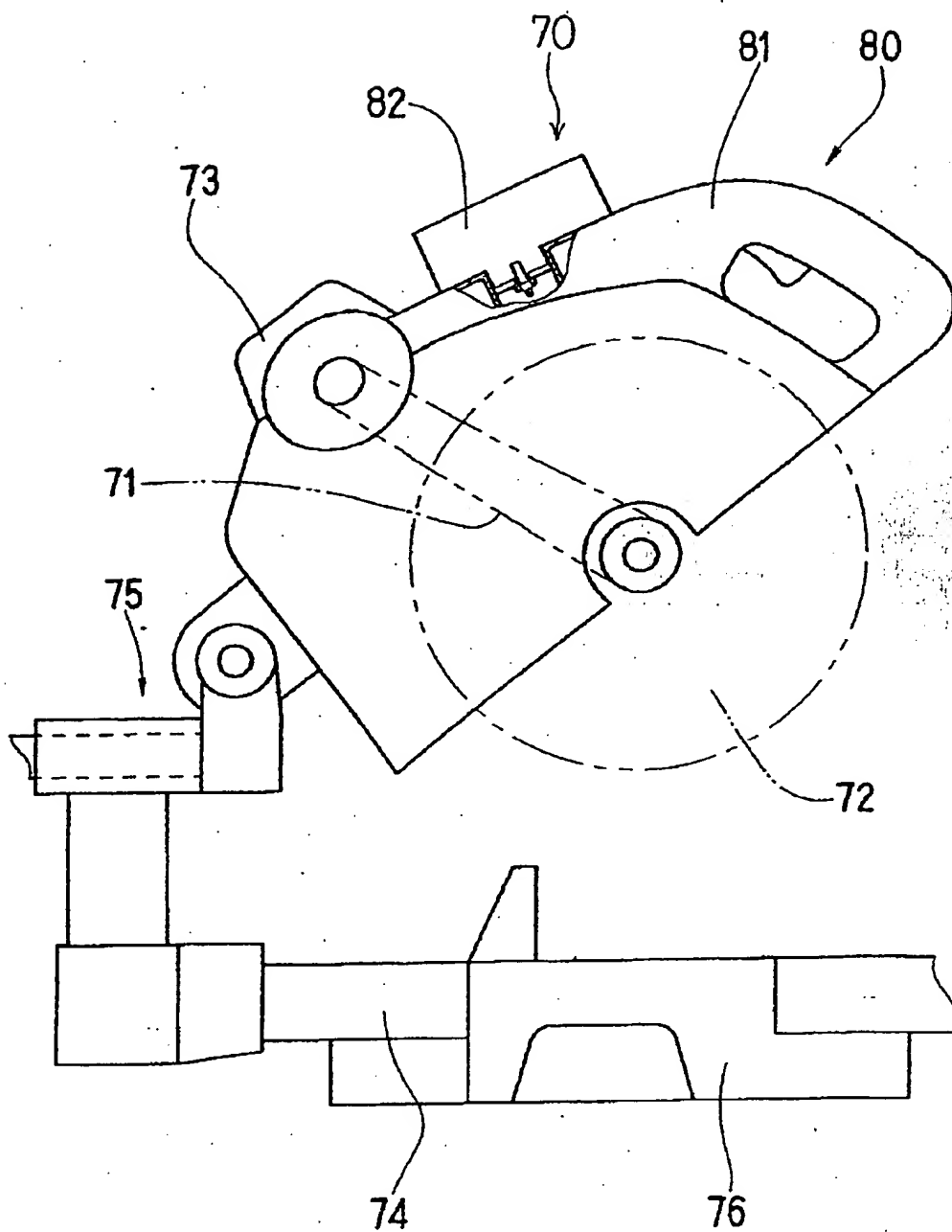
[FIG. 7]



[FIG. 8]



[FIG. 10]



[FIG. 11]

